Ishaan Bhadoo

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Education

Trinity College, University of Cambridge - MASt in Mathematics (Mathematical Tripos Part III)
October 2024 - July 2025

Indian Statistical Institute, Bangalore - Bachelor Of Mathematics (Honors)
September 2021 - May 2024, Overall Grade Average: 94.16% ; Math Grade Average: 96.57%
Details about the coursework can be found here.

Areas Of Interest

Discrete Probability, Percolation theory, Geometric Group Theory, Branching random walks, Random Matrices, Complex analysis.

Projects

Tata Institute of Fundamental Research (TIFR), Mumbai - Visiting Student
As part of a research program. Worked on Percolation Theory (Jan 2024 - June 2024)

- Instructor: Prof. Subhajit Goswami
- Investigated the question of when $p_c(G) = \frac{1}{d-1}$ for $d-$regular transitive graphs. Using ideas from S. Martineau and F. Severo's paper showed that $p_c(G) = \frac{1}{d-1}$ precisely for d-regular trees. Gave counterexamples for the non-transitive case. Read through Hugo Duminil Copin's notes on the Ising model. More specifically understood the theory of random currents and its application to prove continuity and sharpness of the Ising model.

International Centre for Theoretical Sciences (ICTS-TIFR) - Summer Student
As part of a fellowship program; 20 students selected nationwide. (May 2023 - July 2023)

- Instructors: Prof. Riddhipratim Basu, Prof. Anirban Basak
- Worked through Tom Hutchcroft's paper settling the famous Benjamini-Schramm conjecture about the uniqueness of infinite clusters ($p_c = p_u$) in the hyperbolic setting. Read Lyons and Peres' book "Probability on Trees and Networks". Covered necessary prerequisites in percolation theory, hyperbolic geometry and functional analysis. Read Hugo Duminil-Copin and Vincent Tassion's new proof of sharpness for Bernoulli percolation for transitive graphs. Had weekly presentations with instructors, wrote a project report, and gave a presentation at the end of my reading. Slides for my presentation can be found here. My project report can be found here.
- Website : https://www.icts.res.in/academic/summer-research-program

Indian Statistical Institute, Bangalore - Probability Reading Seminar

- Details: Reading seminar organized by Prof. Parthanil Roy, involving undergraduate students, Ph.D. students, research scholars, and professors. Understood the theory of supercritical percolation beyond the euclidean setting, particularly the non-amenable case. Presented the proof of the main theorem and its corollaries from Jonathan Hermon and Tom Hutchcroft's paper titled "Supercritical percolation on nonamenable graphs: Isoperimetry, analyticity, and exponential decay of the cluster size distribution.'

Indian Statistical Institute, Delhi - Directed Reading Project
Worked with Prof. Antar Bandyopadhyay over the summer at ISI - Delhi (June 2022 - August 2022)

- Instructor: Prof. Antar Bandyopadhyay

- Studied Convergence of Random Variables, The Borel-Cantelli lemmas, Weak Convergence, The strong and weak law, Central limit theorem, Asymptotic distribution of the maxima, Extreme value Distributions, Fisher-Tippett-Gnedenko theorem (Following Billingsley's text "Probability and Measure"), Kolmogorov's 0-1 law, consistency theorem, extension theorem. Generating an independent sequence of random variables. Twice a week discussions with Prof. Bandyopadhyay.

Academic Achievements

Trinity College Scholarship
Trinity College, University of Cambridge, Cambridge. £46537 GBP Overseas Bursary for overseas cost and living.

Visiting Students' Research Programme
Selected for VSRP-2024 for summer research at TIFR, Mumbai. 19 students were selected for Mathematics nationwide.

Dean Fellowship - University of Maryland, College Park
Received the Dean Fellowship of 5000 USD (for the first two years), to pursue a Ph.D. in mathematics at UMD. Declined due to the offer from Cambridge.

International Tuition Award, Departmental Award - University of British Columbia, Canada
Received the international tuition award of 3200 CAD per year, and the deparmental award from the department of mathematics of 1500 CAD to pursue MSc in mathematics at UBC. Declined due to the offer from Cambridge.

S. N. Bhatt Memorial Excellence Fellowship
Received the SN Bhatt Memorial fellowship for summer research at ICTS. 20 students were selected for the fellowship, 6 in Mathematics. Awarded 30,000 INR stipend along with travel expenses.

Madhava Mathematics Competition
Selected for the MMC camp with an All India Rank of 10.

Regional Mathematical Olympiad Awardee 2019
Cleared RMO 2019 and selected for the INMO being among the top 30 students in my state.

Other Activities

Madhava Mathematics Competition Nurture Camp(2021)
The MMC Nurture Camp waoffe to certain students based on their performance in the exam. Around 60 students were selected from the country. The camp was held at the **Chennai Mathematical Institute** from 6th June to 11th June 2022. The website for the program can be found here.

Indian National Mathematical Olympiad Training Camp(INMOTC, 2019)
2 week-long training camp to prepare for the national olympiad. 30 students were selected from my state.

Course Audits: Differential Topology (ISI, Bangalore). Instructor: Prof. Suresh Nayak. The course website can be found here. **Measure Theory** for Graduate Students (ISI, Bangalore). Instructor: Prof. Jaydeb Sarkar. The course website can be found here. **Analysis on Graphs** (ISI, Bangalore) Instructor: Prof. Rajarama Bhat. The course website can be found here.

Selected Conferences Attended

Topics in High Dimensional Probability (2nd January - 13th January 2023)
Organizers: Riddhipratim Basu (ICTS-TIFR, India) and Anirban Basak (ICTS-TIFR, India). The website can be found here.

Symposium on combinatorics and probability (30 April - 1 May 2022)
Organizer: Apoorva Khare (Indian Institute of Science, Bangalore). The website can be found here.

A conference on Probability and Stochastic Processes (29 - 31 March 2022)
Organizers: B. V. Rao (CMI), Siva Athreya (ISI Bangalore) & Abhay G. Bhatt (ISI Delhi). The website can be found here.

Talks

Indian Statistical Institute, Bangalore - Mathematics Club
Gave a talk titled "Percolation at criticality for graphs with exponential growth." (Sept 2023)

International Centre for Theoretical Science (ICTS-TIFR)
Gave a talk titled "Percolation on Hyperbolic Graphs" at the end of my stay at ICTS. (July 2023)

Shiv Nadar University, New Delhi
As part of a joint ISI-SNU mathematics talk series. Title of the talk "Conformal Invariance in 2D percolation."(Oct 2023)

Teaching Experience

Indian Statistical Institute, Bangalore - Undergraduate Directed Group Reading Program
Mentored B.Math 1st and 2nd years during winter 2022 and summer 2023 in the following topics:

- **Field and Galois Theory(Nov-Jan 2022).**
- **Martingale Theory(May-July 2023, Joint with a Ph.D. student at ISI).**